

UNIT 16 - NUCLEAR CHEMISTRY

Do 1-4, 11, 13, 14

BALANCING NUCLEAR REACTIONS WORKSHEET

Predict the missing product or reactant in the following nuclear reactions. Determine the type of nuclear reaction (α emission, β emission, γ emission, positron emission, artificial transmutation, fission, or fusion) described.

Type of Nuclear Reaction

1.) Beta

2.) Alpha

3.) Alpha

4.) Fusion

5.) ---

6.) ARTIFICIAL TRANS

7.) Alpha

8.) Positron

9.) FISSION

10.) ARTIFICIAL TRANS

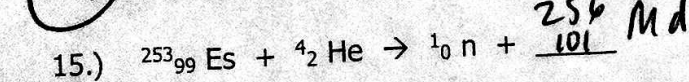
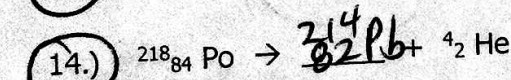
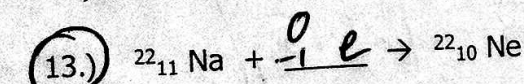
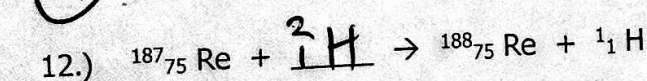
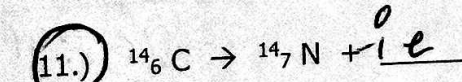
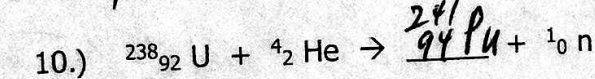
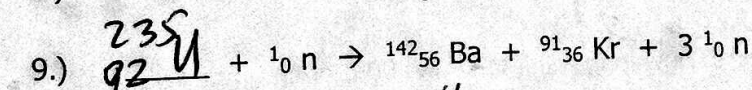
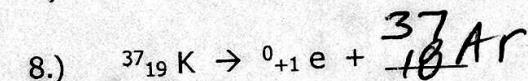
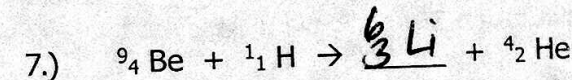
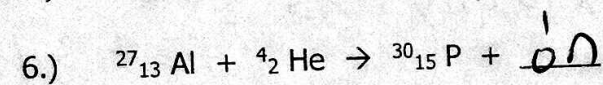
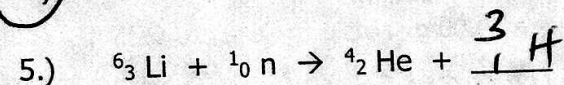
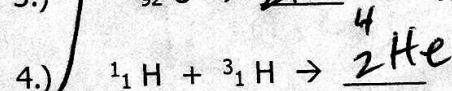
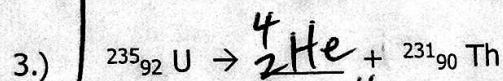
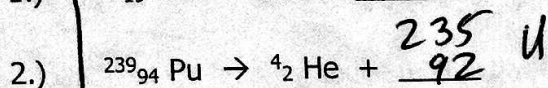
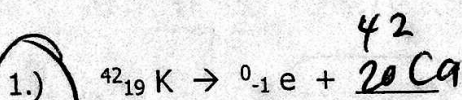
11.) BETA

12.) ARTIFICIAL TRANS

13.) ---

14.) Alpha

15.) Art trans



UNIT 16 - NUCLEAR CHEMISTRY

Do 1-8

HALF-LIFE PROBLEMS WORKSHEET

- 1.) What is the half-life of a 100.0 g sample of nitrogen-16 that decays to 12.5 grams in 21.6 seconds?

$$\frac{100}{2} = \frac{50}{2} = \frac{25}{2} = 12.5 \quad 3 \sqrt{21.6} = 7.25$$

- 2.) All isotopes of technetium are radioactive, but they have widely varying half-lives. If an 800.0 gram sample of technetium-99 decays to 100.0 g of technetium-99 in 639,000 years, what is its half-life?

$$\frac{800}{8} = \frac{100}{1} = 3 \text{ HALF LIVES} \quad 3 \sqrt{639,000} = 213,000 \text{ yrs}$$

- 3.) A 208 g sample of sodium-24 decays to 13.0 g of sodium-24 within 60.0 hours. What is the half-life of this radioactive isotope?

$$\frac{208}{16} = \frac{13}{1} = 4 \text{ H.L.} \quad 4 \sqrt{60.0} = 15.6 \text{ hrs}$$

- 4.) If the half-life of iodine-131 is 8.10 days, how long will it take a 50.00 g sample to decay to 6.25 g?

$$\frac{50}{8} = \frac{25}{2} = \frac{12.5}{2} = 6.25 \quad 8.10 \text{ days} \times 3 = 24.3 \text{ days}$$

- 5.) The half-life of hafnium-156 is 0.025 seconds. How long will it take a 560 g sample to decay to one-fourth of its original mass?

$$\frac{1}{4} \Rightarrow 2 \text{ H.L.} \quad \begin{array}{r} 0.025 \\ \times 2 \\ \hline 0.05 \text{ s} \end{array}$$

- 6.) Chromium-48 has a short half-life of 21.6 hours. How long will it take 360.00 g of chromium-48 to decay to 11.25 g?

$$\frac{360}{2} = \frac{180}{2} = \frac{90}{2} = \frac{45}{2} = \frac{22.5}{2} = 11.25 \quad 21.6 \times 5 = 108 \text{ HRS}$$

- 7.) Potassium-42 has a half-life of 12.4 hours. How much of an 848 g sample of potassium-42 will be left after 62.0 hours?

$$12.4 \sqrt[5]{62} \quad 2^5 = 32 \quad 32 \sqrt{848} = 26.5 \text{ g}$$

- 8.) Carbon-14 has a half-life of 5730 years. How much of a 144 g sample of carbon-14 will remain after 1.719×10^4 years?

$$5730 \sqrt[3]{17190} \quad \frac{144}{2} = \frac{72}{2} = \frac{36}{2} = 18 \text{ g} \quad \text{OR } 8 \sqrt{144}$$

- 9.) If the half-life of uranium-235 is 7.04×10^8 years and 12.5 g of uranium-235 remain after 2.82×10^9 years, how much of the radioactive isotope was in the original sample?

$$7.04 \times 10^8 \sqrt[4]{2.82 \times 10^9} \quad \frac{12.5}{2} = \frac{6.25}{2} = \frac{3.125}{2} = \frac{1.56}{2} = 0.78 \text{ g}$$